PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-310223
(43)Date of publication of application : 23.10.2002

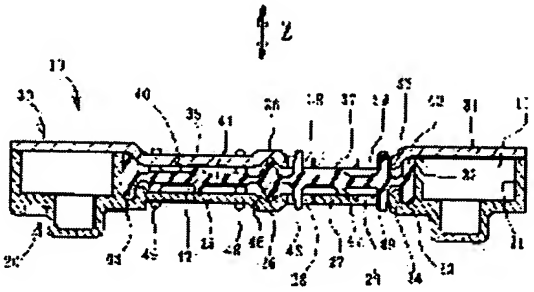
(51)Int.Cl. F16F 13/18
F16F 13/08

(21)Application number : 2001-111872
(22)Date of filing : 10.04.2001

(71)Applicant : YAMASHITA RUBBER CO LTD
(72)Inventor : SAITO ATSUSHI
SATORI KAZUTOSHI

(54) STRUCTURE OF ELASTIC DIAPHRAGM FOR LIQUIE SEALED VIBRATION ISOLATOR

(57)Abstract:
PROBLEM TO BE SOLVED: To vary the spring elasticity of an elastic diaphragm non-linearly and by multi-steps.
SOLUTION: The elastic diaphragm assembly 10 is assembled with the elastic diaphragm 40 disposed between a support part main body 20 and a lid 30. The elastic diaphragm 40 has a circular wall 43 for fixing in the outer periphery, a first support point 46 at the center, a second support point 47 in the middle part, and an inner side stopper 48 on the inner side and an outer side stopper 49 on the outer side with the second support point 47 in-between. The first support point 46 and the second support point 47 are pressure-welded to the support part main body 20 and the lid 30. The inner side stopper 48 and the outer side stopper 49 are made to project in the vibration input direction, inclined toward the center of elastic deformation, and pressed on the support part main body 20 and the lid 30 from the direction orthogonally crossing the main vibration input direction.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While dividing by the main liquid room, the subliquid room, and the diaphragm and opening these main liquid room and a subliquid room for free passage at an orifice path In the liquid seal vibration isolator which prepared the elastic membrane for internal pressure fluctuation absorption of the main liquid room in said diaphragm, while fixing the periphery section of said elastic membrane to supporter material Elastic membrane structure for liquid seal vibration isolators characterized by preparing the side stopper which contacts to supporter material towards preparing the 2nd supporting point in a core in the pars intermedia of the 1st supporting point and a core, and the periphery section, and making each contact to said supporter material, and intersecting perpendicularly with the main oscillating input direction mostly.
[Claim 2] Said side stopper is the elastic membrane structure for liquid seal vibration isolators indicated to claim 1 characterized by inclining so that it may project to the main oscillating input direction and an edge may approach in the direction of a deformation core of elastic membrane, while forming in said elastic membrane and one as a projection which projects in the main oscillating input direction.
[Claim 3] Said side stopper is the elastic membrane structure for liquid seal vibration isolators indicated to claim 1 characterized by being arranged on both sides of said 2nd supporting point at the periphery section [of elastic membrane], and core side in between.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the elastic membrane structure for liquid seal vibration isolators, and relates especially that spring elasticity to multistage and the thing it was made to change nonlinearly.
[0002]
[Description of the Prior Art] The liquid seal vibration isolator which prepared elastic membrane is well-known. The outlines of a liquid seal vibration isolator including an example of elastic membrane are shown in drawing 8 . The 1st attachment section 1 which this liquid seal vibration isolator is cone mounting for engine support, and is attached in an engine side, While connecting the 2nd attachment section 2 attached in a car-body side with the rubber object 3 of a cone form and sealing the building envelope of the rubber object 3 with a diaphragm 4 Form a diaphragm 5 in the interior, divide in the main liquid room 6 and the subliquid room 7, and are open for free passage at the orifice path of an illustration abbreviation of both the liquid room. A diaphragm 5 fixes the perimeter of the elastic membrane 9 which consists of rubber etc. by the frame 8 with rigidity, and absorbs this by carrying out elastic deformation according to internal pressure fluctuation of the main liquid room 6.
[0003]
[Problem(s) to be Solved by the Invention] By the way, to such a liquid seal vibration isolator, since a degree of comfort is made good, it becomes small vibration with a low ** spring, large vibration is asked for a property which serves as high attenuation, and elastic membrane can also realize such a property. However, in the case of structure, the relation of the force and deformation which are almost fixed as for the spring elasticity in the elastic deformation of elastic membrane 9, and are added serves as an approximate line form conventionally [above-mentioned] only for the main oscillating input direction Z direction and fixing [of a ****** Fig.] the periphery section of elastic membrane 9 by the frame 8 from the upper and lower sides. Therefore, when priority was given to the degree of comfort which absorbs small vibration, high attenuation was not obtained, and since it did not become a low ** spring when setting up on the other hand so that priority might be given to attenuation of large vibration, the compromise in-between setting fake colander was not obtained. Then, the invention in this application aims spring elasticity at multistage and making change possible nonlinearly, without making such a compromise.
[0004]
[Means for Solving the Problem] The 1st invention which relates to the liquid seal vibration isolator of this application in order to solve the above-mentioned technical problem While dividing by the main liquid room, the subliquid room, and the diaphragm and opening these main liquid room and a subliquid room for free passage at an orifice path In the liquid seal vibration isolator which prepared the elastic membrane for internal pressure fluctuation absorption of the main liquid room in said diaphragm, while fixing the periphery section of said elastic membrane to supporter material It is characterized by preparing the side stopper which contacts to supporter material towards preparing the 2nd supporting point in a core in the pars intermedia of the 1st supporting point and a core, and the periphery section, and making each contact to said supporter material, and intersecting perpendicularly with the main oscillating input direction mostly.
[0005] In the 1st above-mentioned invention, the 2nd invention is characterized by inclining so that it may project to the main oscillating input direction and an edge may approach in the direction of a deformation core of elastic membrane while it forms said side stopper in said elastic membrane and one as a projection which projects in the main oscillating input direction. At this time, said side stopper can also be arranged to a periphery section [of elastic membrane], and core side on both sides of said 2nd supporting point in between.
[0006]
[Effect of the Invention] Since according to the 1st invention the 1st supporting point was prepared in the core and the 2nd supporting point was prepared in pars intermedia while fixing the periphery section of elastic membrane, small vibration inputs and is not rich, the whole carries out elastic deformation, the 1st supporting point is compressed, and spring elasticity becomes high gradually. In this phase, while absorbing small vibration, it becomes a low ** spring. If compression of the 1st supporting point becomes a limitation soon, elastic deformation will be produced between the 1st supporting point and the periphery section by using the 1st supporting point as the supporting point. Therefore, since the span of elastic deformation is halved, spring elasticity becomes large. In the elastic deformation of this phase, it is carried out compressing the 2nd supporting point, a little larger vibration can be absorbed, and a low ** spring is maintained comparatively.
[0007] If the 2nd supporting point also becomes the compressed limit soon, it will change to the elastic deformation between the 2nd supporting point and the 1st supporting point and between the 2nd supporting point and the periphery section by using the 2nd supporting point as the supporting point. Since a deformation span reduces this elastic deformation by half further, spring elasticity becomes remarkably large. And since a side stopper is strongly forced on a supporter material side, spring elasticity increases also by this, consequently high attenuation can be realized. And since the side stopper is pressed against the 1st supporting point and the 2nd supporting point list from the beginning to supporter material, a tap tone does not occur, but the noise is mitigated. Moreover, since a side stopper is pressed to a supporter material side from the main oscillating input direction and the direction which carries out an abbreviation rectangular cross, while being able to contribute to nonlinear change of spring elasticity, elastic deformation of elastic membrane is not checked.
[0008] Since according to the 2nd invention it is gradually pressed strongly as it is the projection in which a side stopper projects in the main oscillating input direction, and it is not strongly pressed to supporter material but the elastic deformation of elastic membrane becomes large at the beginning, since it leans so that a tip side may approach the core side of the elastic deformation in elastic membrane to the main oscillating input direction, spring elasticity becomes large graduated. For this reason, change of nonlinear spring elasticity can be discovered notably.
[009] If a side stopper is arranged on both sides of the 2nd supporting point 1st near the supporting point of the periphery section and a core at this time, since the effectiveness of a side stopper arises in a phase to the core and the periphery section from which the 1st supporting point turned into the supporting point of deformation, gradual change of the spring elasticity by the side stopper can be enlarged further.
[0010]
[Embodiment of the Invention] Hereafter, an example is explained based on a drawing. Drawing in which the 2-2 line sectional view of drawing 1 pressing against the top view of the elastic membrane assembly with which drawing 1 unified elastic membrane and a base material, and

drawing 2 , and the 1st supporting point's pressing drawing 3 against, and expanding and showing structure, drawing where the top view of elastic membrane and drawing 5 explain th[illegible]line sectional view of drawing 4 , and, as for drawing[illegible]rawing 4 explains a fasten lump of elastic membrane, and drawing 7 are drawi[illegible]howing an operation theoretically.

[0011] First, in drawing 1 and drawing 2 , between the supporter body 20 and a free wheel plate 30, this elastic membrane assembly 10 puts elastic membrane 40, unifies, and makes a plane view round shape as a whole. The slot 21 which carries out opening is established in the upper part of drawing 2 at the periphery section, and the supporter body 20 forms the damping orifice path 11 using this slot 21. the circular sulcus 23 of the letter of the cross-section abbreviation for U characters is established in the inner circumference side of the annular bridge wall 22 which makes the internal surface of a slot 21, and the inner circle wall 24 of a circular sulcus 23 is long to the vertical direction of drawing 2 — it presses and has become a field.

[0012] The inside part surrounded by the annular bridge wall 22 is the elastic membrane 40 hold section, and the core 26 of the circular pars basilaris ossis occipitalis 25 formed inside an inner circle wall 24 makes the bend which projects under drawing 2 . The interstitial segment of a core 26 and an inner circle wall 24 makes the middle fixed part 27. The middle fixed part 27 is a part of pars basilaris ossis occipitalis 25, and openings 28 and 29 are formed in the inner circumference and periphery side, respectively. Two or more formation of each openings 28 and 29 is carried out at equal intervals on a concentric circle. Especially the opening 29 is formed in the shape of [long] radii, and these correspond with opening formed in a free-wheel-plate 30 side (refer to drawing 1).

[0013] A free wheel plate 30 is metal approximate circle plate-like part material, and the periphery section 31 covers opening of a slot 21, and it forms the damping orifice path 11 with the slot 21. In addition, although not illustrated, the entry of the damping orifice path which carries out opening is formed in the main liquid room at the periphery section 31, and the outlet which carries out opening is established in the subliquid room at the periphery section pars-basilaris-ossis-occipitalis side of the supporter body 20. It is the part which moves from the periphery section 31 of a free wheel plate 30 to an inner circumference side, and the part which serves as the upper part of an inner circumference side and a circular sulcus 23 from the contact section with the annular bridge wall 22 makes the step 33 which falls to the lower part side of drawing 2 .

[0014] From the periphery section 31 of a free wheel plate 30, the inner circumference section is the circular head-lining section 35 corresponding to a pars basilaris ossis occipitalis 25, and the core 36 curves to ** to the upper part of drawing 2 , and corresponds with a core 26. Moreover, the middle fixed part 37 and openings 38 and 39 are formed in the middle fixed part 27 and openings 28 and 29, and the location that corresponds, respectively. The middle fixed part 37 is a part of head-lining section 35. Between a pars basilaris ossis occipitalis 25 and the head-lining section 35, suitable spacing is prepared and elastic membrane 40 is contained.

[0015] Rubber, an elastomer, etc. are the members which consist of a spring material suitably, two or more projected parts project to one, and elastic membrane 40 is formed in the vertical direction in drawing 5 of the body section 41 while it makes plane view approximate circle tabular, so that in detail [drawing 4 and 5]. First, the annular wall 43 which fits into the periphery section to a circular sulcus 23 projects in the vertical direction of drawing 5 , and is formed in it, and the outside side stopper 49 is formed in the location corresponding to the inside side stopper 48 and openings 29 and 39 in the location corresponding to the 2nd supporting point 47 and openings 28 and 38 at the location corresponding to the 1st supporting point 46 and the middle fixed parts 27 and 37 in a core.

[0016] As for the 1st supporting point 46, a tip fits in to cores 26 and 36, and the 2nd supporting point 47 contacts to the middle fixed parts 27 and 37. In addition, as shown in drawing 6 , the interference projected for a long time so that the tip of the 1st supporting point 46 and the 2nd supporting point 47 might be compressed by cores 26 and 36 and the middle fixed parts 27 and 37 at the time of assembly is prepared.

[0017] The inside side stopper 48 and the outside side stopper 49 are formed for a long time so that it may project from 29 and 39 to openings 28 and 38 and the exterior. In addition, the die length of a hoop direction is die length comparable as the inside side stopper 48 and the outside side stopper 49, and the magnitude of each openings 28, 29, 38, and 39 is carrying out opening of the frontage in the direction of a path widely so that the elastic deformation of the inside side stopper 48 and the outside side stopper 49 can be permitted.

[0018] Drawing 3 is an enlarged drawing to show the interference to the core 26 in the 1st supporting point 46, and is **. In addition, The same is said of a core 36 side. Although the interference 50 which A of an upper case shows the condition at the time of assembly, and is shown by the imaginary line formed at the tip of the 1st supporting point 46 is compressed and it disappears, the gap 51 is still formed in the perimeter pressed to the core 26 of the 1st supporting point 46.

[0019] The lower berth B of drawing 3 shows the condition of the 1st supporting point 46 at the time of the elastic deformation of elastic membrane 40, if the 1st supporting point 46 is pressed strongly and compressed in this case to a core 26, elastic deformation will be carried out so that a gap 51 may be filled, and the restoration section 52 which filled the gap 51 shown with a slash will be formed. If it will be in this condition, the spring elasticity of the 1st supporting point 46 will become remarkably large, and will change in nonlinear.

[0020] As shown in drawing 5 , the inside side stopper 48 leans to the main oscillating input direction Z so that a tip may turn to the method of the outside of radial. Since this inclination direction serves as the 1st supporting point 46 and elastic deformation between the annular walls 43 focusing on the 2nd supporting point 47 in the phase where the inside side stopper 48 functions, it will incline to the core 47, i.e., 2nd supporting point, side of elastic deformation. In addition, adjustment of it being determined suitably, crawling [which also spreads coincidence] and enlarging a gap or a side more is possible for angles of inclination a and b to arbitration. Moreover, only the field pressed to the support-structure section 20 and a free wheel plate 30, without leaning the whole may be formed in the shape of a taper.

[0021] On the other hand, the outside side stopper 49 leans to the core side. In this case, also in any of the subsequent phase where the initial stage and the 2nd supporting point 47 when the 1st supporting point 46 takes the lead in elastic deformation take the lead, it will lean to the core side of elastic deformation. Moreover, angles of inclination c and d can be set as arbitration like the inside side stopper 48.

[0022] Next, an operation of this example is explained. Drawing 7 shows deformation of elastic membrane 40 typically, and A is a primitive state before elastic deformation first. B is the elastic deformation of an initial stage and corresponds to small vibration of small-size width of face comparatively. In this phase, in order that the elastic membrane 40 whole may make one arc, may curve below and may absorb vibration in the condition that spring elasticity is comparatively small, compressing the 1st supporting point 46 since the annular wall 43 of the periphery section is fixed, it becomes a low ** spring.

[0023] If vibration with still larger C is added and becomes the compressed limit of the 1st supporting point 46, since the 1st supporting point 46 will turn into the fixed point, the annular wall 43 and the 1st supporting point 46 are used as the fixed end, the elastic deformation centering on the 2nd supporting point 47 is produced, and, as for elastic membrane 40, the letter of the cross-section abbreviation for W characters is made as a whole. In this phase, since the span of elastic deformation is halved, spring elasticity becomes large gradually and can absorb a bigger vibration.

[0024] Since the condition that there was an input of large vibration further is shown and the 2nd supporting point 47 also serves as the compressed limit in this case, D produces elastic deformation by using the 2nd supporting point 47 as the supporting point between the 2nd supporting point 47 and the annular wall 43 and between the 2nd supporting point 47 and the 1st supporting point 46. Namely, since elastic deformation will be further carried out to the letter of the cross-section abbreviation for W characters between annular ** 43 and the 1st supporting point 46 and the span of elastic deformation is further reduced by half, spring elasticity becomes very large, and the absorption of vibration by elastic membrane 40 of it is lost, and it will be in the high attenuation condition of attenuating vibration by liquid column resonance in a damping orifice path.

[0025] And in this condition, the inside side stopper 48 and the outside side stopper 49 incline so that each lower limit of each elastic-

deformation side point, i.e., drawing, may keep away on both sides of the 2nd supporting point 47 after this, and each is pressed strongly to the middle fixed part 27 and an inner circle 24. Since opening 28 and the outside side stopper 49 in the direction which makes contact light with the middle fixed part 27 an inner circle wall 24 at the beginning, change of the spring elasticity depended for pressing goes up nonlinearly. Therefore, nonlinear change of the spring elasticity in elastic membrane 40 can be amplified also by the inside side stopper 48 and the outside side stopper 49.

[0026] Moreover, since the inside side stopper 48 and the outside side stopper 49 are pressed from an abbreviation rectangular cross to the main oscillating input direction Z to a supporter body 20 or free-wheel-plate 30 side, they seldom contribute to change of spring elasticity to small vibration, but contribute to low ** spring-ization. Since direct elastic deformation furthermore is not resisted by the upper and lower sides of elastic membrane 40, elastic deformation of elastic membrane 40 is not checked.

[0027] Moreover, since the 1st supporting point 46, the 2nd supporting point 47, the inside side stopper 48, and the outside side stopper 49 are contacted from the beginning to the supporter body 20 or free-wheel-plate 30 side, even if elastic membrane 40 carries out elastic deformation, its generating a tap tone decreases and they are useful to reduction of the noise.

[0028] in addition, the invention in this application is not limited to each above-mentioned example, and in the principle of invention, it can deform or it can be applied to versatility. For example, with [the number of supporting points] two [or more], it is possible to arbitration to make [more / still] it. Moreover, it is applicable to the object for automobiles other than an engine mount, or other various vibration isolators.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the elastic membrane structure for liquid seal vibration isolators, and relates especially that spring elasticity to multistage and the thing it was made to change nonlinearly.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] The liquid seal vibration isolator which prepared elastic membrane is well-known. The outlines of a liquid seal vibration isolator including an example of elastic membrane are shown in drawing 8 . The 1st attachment section 1 which this liquid seal vibration isolator is cone mounting for engine support, and is attached in an engine side, While connecting the 2nd attachment section 2 attached in a car-body side with the rubber object 3 of a cone form and sealing the building envelope of the rubber object 3 with a diaphragm 4 Form a diaphragm 5 in the interior, divide in the main liquid room 6 and the subliquid room 7, and are open for free passage at the orifice path of an illustration abbreviation of both the liquid room. A diaphragm 5 fixes the perimeter of the elastic membrane 9 which consists of rubber etc. by the frame 8 with rigidity, and absorbs this by carrying out elastic deformation according to internal pressure fluctuation of the main liquid room 6.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since according to the 1st invention the 1st supporting point was prepared in the core and the 2nd supporting point was prepared in pars intermedia while fixing the periphery section of elastic membrane, small vibration inputs and is not rich, the whole carries out elastic deformation, the 1st supporting point is compressed, and spring elasticity becomes high gradually. In this phase, while absorbing small vibration, it becomes a low ** spring. If compression of the 1st supporting point becomes a limitation soon, elastic deformation will be produced between the 1st supporting point and the periphery section by using the 1st supporting point as the supporting point. Therefore, since the span of elastic deformation is halved, spring elasticity becomes large. In the elastic deformation of this phase, it is carried out compressing the 2nd supporting point, a little larger vibration can be absorbed, and a low ** spring is maintained comparatively.
[0007] If the 2nd supporting point also becomes the compressed limit soon, it will change to the elastic deformation between the 2nd supporting point and the 1st supporting point and between the 2nd supporting point and the periphery section by using the 2nd supporting point as the supporting point. Since a deformation span reduces this elastic deformation by half further, spring elasticity becomes remarkably large. And since a side stopper is strongly forced on a supporter material side, spring elasticity increases also by this, consequently high attenuation can be realized. And since the side stopper is pressed against the 1st supporting point and the 2nd supporting point list from the beginning to supporter material, a tap tone does not occur, but the noise is mitigated. Moreover, since a side stopper is pressed to a supporter material side from the main oscillating input direction and the direction which carries out an abbreviation rectangular cross, while being able to contribute to nonlinear change of spring elasticity, elastic deformation of elastic membrane is not checked.
[0008] Since according to the 2nd invention it is gradually pressed strongly as it is the projection in which a side stopper projects in the main oscillating input direction, and it is not strongly pressed to supporter material but the elastic deformation of elastic membrane becomes large at the beginning, since it leans so that a tip side may approach the core side of the elastic deformation in elastic membrane to the main oscillating input direction, spring elasticity becomes large graduated. For this reason, change of nonlinear spring elasticity can be discovered notably.
[009] If a side stopper is arranged on both sides of the 2nd supporting point 1st near the supporting point of the periphery section and a core at this time, since the effectiveness of a side stopper arises in a phase to the core and the periphery section from which the 1st supporting point turned into the supporting point of deformation, gradual change of the spring elasticity by the side stopper can be enlarged further.
[0010]
[Embodiment of the Invention] Hereafter, an example is explained based on a drawing. Drawing in which the 2-2 line sectional view of drawing 1 pressing against the top view of the elastic membrane assembly with which drawing 1 unified elastic membrane and a base material, and drawing 2 , and the 1st supporting point's pressing drawing 3 against, and expanding and showing structure, drawing where the top view of elastic membrane and drawing 5 explain the 5-5 line sectional view of drawing 4 , and, as for drawing 6 , drawing 4 explains a fasten lump of elastic membrane, and drawing 7 are drawings showing an operation theoretically.
[0011] First, in drawing 1 and drawing 2 , between the supporter body 20 and a free wheel plate 30, this elastic membrane assembly 10 puts elastic membrane 40, unifies, and makes a plane view round shape as a whole. The slot 21 which carries out opening is established in the upper part of drawing 2 at the periphery section, and the supporter body 20 forms the damping orifice path 11 using this slot 21. the circular sulcus 23 of the letter of the cross-section abbreviation for U characters is established in the inner circumference side of the annular bridge wall 22 which makes the internal surface of a slot 21, and the inner circle wall 24 of a circular sulcus 23 is long to the vertical direction of drawing 2 -- it presses and has become a field.
[0012] The inside part surrounded by the annular bridge wall 22 is the elastic membrane 40 hold section, and the core 26 of the circular pars basilaris ossis occipitalis 25 formed inside an inner circle wall 24 makes the bend which projects under drawing 2 . The interstitial segment of a core 26 and an inner circle wall 24 makes the middle fixed part 27. The middle fixed part 27 is a part of pars basilaris ossis occipitalis 25, and openings 28 and 29 are formed in the inner circumference and periphery side, respectively. Two or more formation of each openings 28 and 29 is carried out at equal intervals on a concentric circle. Especially the opening 29 is formed in the shape of [long] radii, and these correspond with opening formed in a free-wheel-plate 30 side (refer to drawing 1).
[0013] A free wheel plate 30 is metal approximate circle plate-like part material, and the periphery section 31 covers opening of a slot 21, and it forms the damping orifice path 11 with the slot 21. In addition, although not illustrated, the entry of the damping orifice path which carries out opening is formed in the main liquid room at the periphery section 31, and the outlet which carries out opening is established in the subliquid room at the periphery section pars-basilaris-ossis-occipitalis side of the supporter body 20. It is the part which moves from the periphery section 31 of a free wheel plate 30 to an inner circumference side, and the part which serves as the upper part of an inner circumference side and a circular sulcus 23 from the contact section with the annular bridge wall 22 makes the step 33 which falls to the lower part side of drawing 2 .
[0014] From the periphery section 31 of a free wheel plate 30, the inner circumference section is the circular head-lining section 35 corresponding to a pars basilaris ossis occipitalis 25, and the core 36 curves to ** to the upper part of drawing 2 , and corresponds with a core 26. Moreover, the middle fixed part 37 and openings 38 and 39 are formed in the middle fixed part 27 and openings 28 and 29, and the location that corresponds, respectively. The middle fixed part 37 is a part of head-lining section 35. Between a pars basilaris ossis occipitalis 25 and the head-lining section 35, suitable spacing is prepared and elastic membrane 40 is contained.
[0015] Rubber, an elastomer, etc. are the members which consist of a spring material suitably, two or more projected parts project to one, and elastic membrane 40 is formed in the vertical direction in drawing 5 of the body section 41 while it makes plane view approximate circle tabular, so that in detail [drawing 4 and 5]. First, the annular wall 43 which fits into the periphery section to a circular sulcus 23 projects in the vertical direction of drawing 5 , and is formed in it, and the outside side stopper 49 is formed in the location corresponding to the inside side stopper 48 and openings 29 and 39 in the location corresponding to the 2nd supporting point 47 and openings 28 and 38 at the location corresponding to the 1st supporting point 46 and the middle fixed parts 27 and 37 in a core.
[0016] As for the 1st supporting point 46, a tip fits in to cores 26 and 36, and the 2nd supporting point 47 contacts to the middle fixed parts 27 and 37. In addition, as shown in drawing 6 , the interference projected for a long time so that the tip of the 1st supporting point 46 and the 2nd supporting point 47 might be compressed by cores 26 and 36 and the middle fixed parts 27 and 37 at the time of assembly is prepared.

[0017] The inside side stopper 48 and the outside side stopper 49 are formed for a long time so that it may project from 29 and 39 to openings 28 and 38 and the exterior. In addition, the die length of a hoop direction is die length comparable as the inside side stopper 48 and the outside side stopper 49, and the magnitude of each openings 28, 29, 38, and 39 is carrying out damaging of the frontage in the direction of a path widely so that the elastic deformation of the inside side stopper 48 and the outside side stopper 49 can be permitted.
[0018] Drawing 3 is an enlarged drawing to show the interference to the core 26 in the 1st supporting point 46, and is **. In addition. The same is said of a core 36 side. Although the interference 50 which A of an upper case shows the condition at the time of assembly, and is shown by the imaginary line formed at the tip of the 1st supporting point 46 is compressed and it disappears, the gap 51 is still formed in the perimeter pressed to the core 26 of the 1st supporting point 46.
[0019] The lower berth B of drawing 3 shows the condition of the 1st supporting point 46 at the time of the elastic deformation of elastic membrane 40, if the 1st supporting point 46 is pressed strongly and compressed in this case to a core 26, elastic deformation will be carried out so that a gap 51 may be filled, and the restoration section 52 which filled the gap 51 shown with a slash will be formed. If it will be in this condition, the spring elasticity of the 1st supporting point 46 will become remarkably large, and will change in nonlinear.
[0020] As shown in drawing 5 , the inside side stopper 48 leans to the main oscillating input direction Z so that a tip may turn to the method of the outside of radial. Since this inclination direction serves as the 1st supporting point 46 and elastic deformation between the annular walls 43 focusing on the 2nd supporting point 47 in the phase where the inside side stopper 48 functions, it will incline to the core 47, i.e., 2nd supporting point, side of elastic deformation. In addition, adjustment of it being determined suitably, crawling [which also spreads coincidence] and enlarging a gap or a side more is possible for angles of inclination a and b to arbitration. Moreover, only the field pressed to the support-structure section 20 and a free wheel plate 30, without leaning the whole may be formed in the shape of a taper.
[0021] On the other hand, the outside side stopper 49 leans to the core side. In this case, also in any of the subsequent phase where the initial stage and the 2nd supporting point 47 when the 1st supporting point 46 takes the lead in elastic deformation take the lead, it will lean to the core side of elastic deformation. Moreover, angles of inclination c and d can be set as arbitration like the inside side stopper 48.
[0022] Next, an operation of this example is explained. Drawing 7 shows deformation of elastic membrane 40 typically, and A is a primitive state before elastic deformation first. B is the elastic deformation of an initial stage and corresponds to small vibration of small-size width of face comparatively. In this phase, in order that the elastic membrane 40 whole may make one arc, may curve below and may absorb vibration in the condition that spring elasticity is comparatively small, compressing the 1st supporting point 46 since the annular wall 43 of the periphery section is fixed, it becomes a low ** spring.
[0023] If vibration with still larger C is added and becomes the compressed limit of the 1st supporting point 46, since the 1st supporting point 46 will turn into the fixed point, the annular wall 43 and the 1st supporting point 46 are used as the fixed end, the elastic deformation centering on the 2nd supporting point 47 is produced, and, as for elastic membrane 40, the letter of the cross-section abbreviation for W characters is made as a whole. In this phase, since the span of elastic deformation is halved, spring elasticity becomes large gradually and can absorb a bigger vibration.
[0024] Since the condition that there was an input of large vibration further is shown and the 2nd supporting point 47 also serves as the compressed limit in this case, D produces elastic deformation by using the 2nd supporting point 47 as the supporting point between the 2nd supporting point 47 and the annular wall 43 and between the 2nd supporting point 47 and the 1st supporting point 46. Namely, since elastic deformation will be further carried out to the letter of the cross-section abbreviation for W characters between annular ** 43 and the 1st supporting point 46 and the span of elastic deformation is further reduced by half, spring elasticity becomes very large, and the absorption of vibration by elastic membrane 40 of it is lost, and it will be in the high attenuation condition of attenuating vibration by liquid column resonance in a damping orifice path.
[0025] And in this condition, the inside side stopper 48 and the outside side stopper 49 incline so that each lower limit of each elastic-deformation side point, i.e., drawing, may keep away on both sides of the 2nd supporting point 47 after this, and each is pressed strongly to the middle fixed part 27 and an inner circle wall 24. Since opening 28 and the outside side stopper 49 lean in the direction which makes contact light with the middle fixed part 27 and an inner circle wall 24 at the beginning, change of this spring elasticity depended for pressing goes up nonlinearly. Therefore, nonlinear change of the spring elasticity in elastic membrane 40 can be amplified also by the inside side stopper 48 and the outside side stopper 49.
[0026] Moreover, since the inside side stopper 48 and the outside side stopper 49 are pressed from an abbreviation rectangular cross to the main oscillating input direction Z to a supporter body 20 or free-wheel-plate 30 side, they seldom contribute to change of spring elasticity to small vibration, but contribute to low ** spring-ization. Since direct elastic deformation furthermore is not resisted by the upper and lower sides of elastic membrane 40, elastic deformation of elastic membrane 40 is not checked.
[0027] Moreover, since the 1st supporting point 46, the 2nd supporting point 47, the inside side stopper 48, and the outside side stopper 49 are contacted from the beginning to the supporter body 20 or free-wheel-plate 30 side, even if elastic membrane 40 carries out elastic deformation, its generating a tap tone decreases and they are useful to reduction of the noise.
[0028] in addition, the invention in this application is not limited to each above-mentioned example, and in the principle of invention, it can deform or it can be applied to versatility. For example, with [the number of supporting points] two [or more], it is possible to arbitration to make [more / still] it. Moreover, it is applicable to the object for automobiles other than an engine mount, or other various vibration isolators.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, to such a liquid seal vibration isolator, since a degree of comfort is made good, it becomes small vibration with a low ** spring, large vibration is asked for a property which serves as high attenuation, and elastic membrane can also realize such a property. However, in the case of structure, the relation of the force and deformation which are almost fixed as for the spring elasticity in the elastic deformation of elastic membrane 9, and are added serves as an approximate line form conventionally [above-mentioned] only for the main oscillating input direction Z direction and fixing [of a ****** Fig.] the periphery section of elastic membrane 9 by the frame 8 from the upper and lower sides. Therefore, when priority was given to the degree of comfort which absorbs small vibration, high attenuation was not obtained, and since it did not become a low ** spring when setting up on the other hand so that priority might be given to attenuation of large vibration, the compromise in-between setting fake colander was not obtained. Then, the invention in this application aims spring elasticity at multistage and making change possible nonlinearly, without making such a compromise.

[Translation done.]

MEANS

[Means for Solving the Problem] The 1st invention which relates to the liquid seal vibration isolator of this application in order to solve the above-mentioned technical problem While dividing by the main liquid room, the subliquid room, and the diaphragm and opening these main liquid room and a subliquid room for free passage at an orifice path In the liquid seal vibration isolator which prepared the elastic membrane for internal pressure fluctuation absorption of the main liquid room in said diaphragm, while fixing the periphery section of said elastic membrane to supporter material It is characterized by preparing the side stopper which contacts to supporter material towards preparing the 2nd supporting point in a core in the pars intermedia of the 1st supporting point and a core, and the periphery section, and making each contact to said supporter material, and intersecting perpendicularly with the main oscillating input direction mostly.
[0005] In the 1st above-mentioned invention, the 2nd invention is characterized by inclining so that it may project to the main oscillating input direction and an edge may approach in the direction of a deformation core of elastic membrane while it forms said side stopper in said elastic membrane and one as a projection which projects in the main oscillating input direction. At this time, said side stopper can also be arranged to a periphery section [of elastic membrane], and core side on both sides of said 2nd supporting point in between.

[Translation done.]

DESCRIPTION OF DRAWINGS

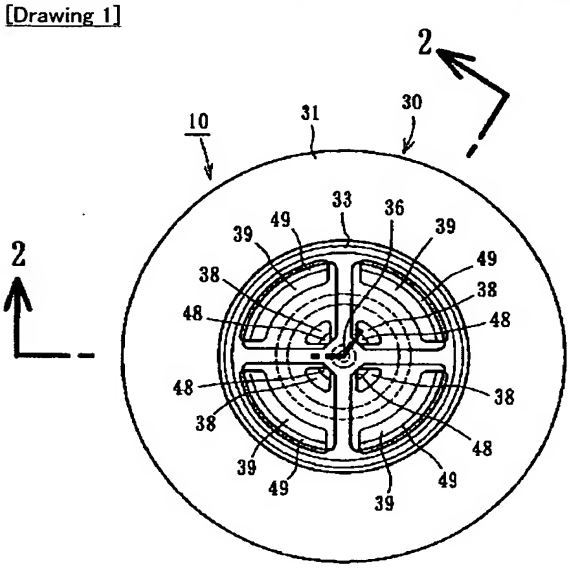
[Brief Description of the Drawings]
[Drawing 1] The top view of the elastic membrane assembly concerning an example
[Drawing 2] The 2-2 line sectional view of drawing 1
[Drawing 3] Drawing in which the 1st supporting point's pressing against, and expanding and showing structure
[Drawing 4] The top view of elastic membrane
[Drawing 5] The 5-5 line sectional view of drawing 4
[Drawing 6] Drawing explaining a fasten lump of elastic membrane
[Drawing 7] Drawing 7 is drawing showing an operation theoretically.
[Drawing 8] The schematic diagram of the conventional example
[Description of Notations]
10: an elastic membrane assembly, 20:supporter body, 30:free wheel plate, 40:elastic membrane, a 43:annular wall, and 46: -- the 1st supporting point and 47: -- the 2nd supporting point, 48:inside side stopper, and 49:outside side stopper

---

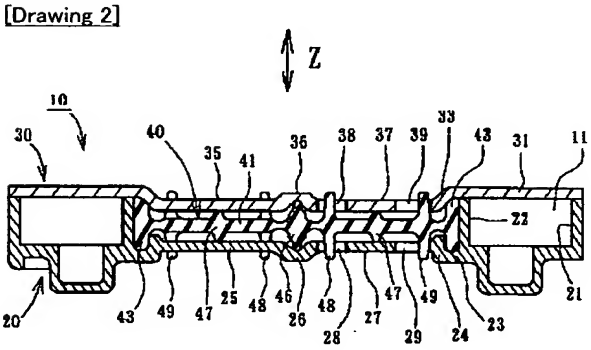
[Translation done.]

DRAWINGS

[Drawing 1]

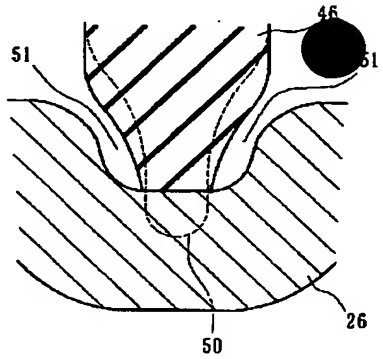


[Drawing 2]

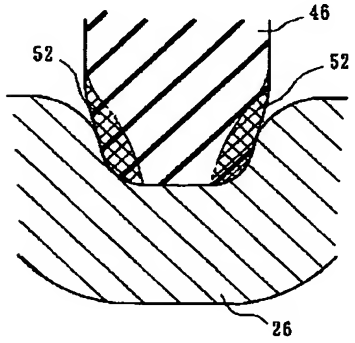


[Drawing 3]

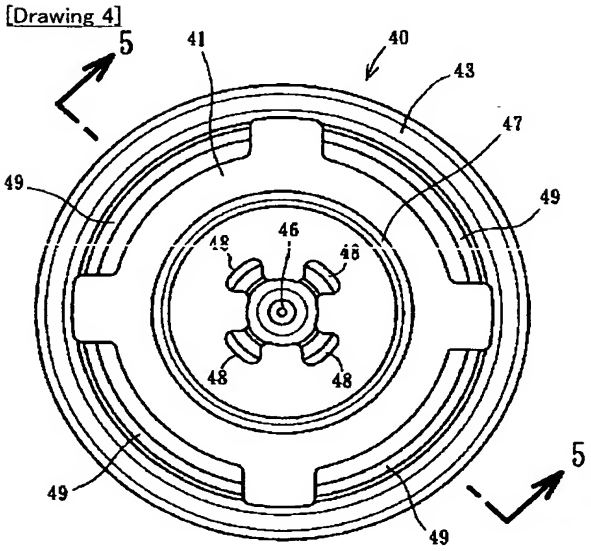
A



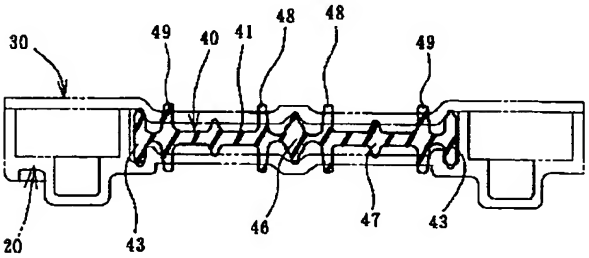
B



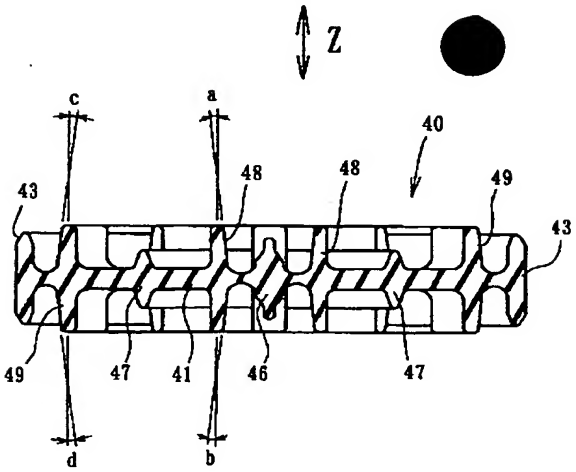
[Drawing 4]



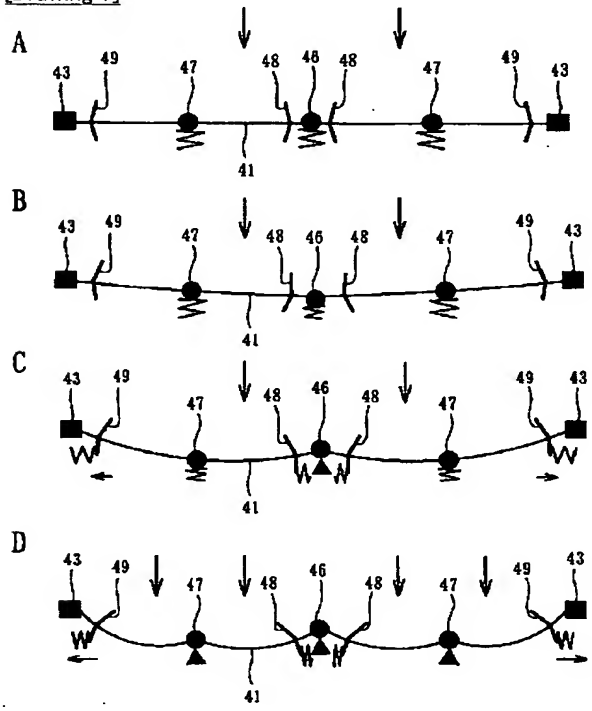
[Drawing 6]



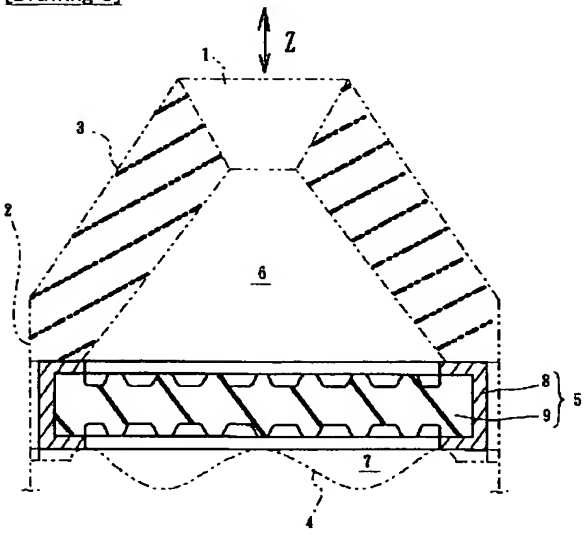
[Drawing 5]



[Drawing 7]



[Drawing 8]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－310223
（P2002－310223A）
(43)公開日　平成14年10月23日(2002.10.23)

(51)Int.Cl.⁷	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
Ｆ１６Ｆ　13/18		Ｆ１６Ｆ　13/00	６２０Ｒ　３Ｊ０４７
13/08			６２０Ａ

審査請求　未請求　請求項の数３　ＯＬ　（全６頁）

(21)出願番号　特願2001－111872(P2001－111872)

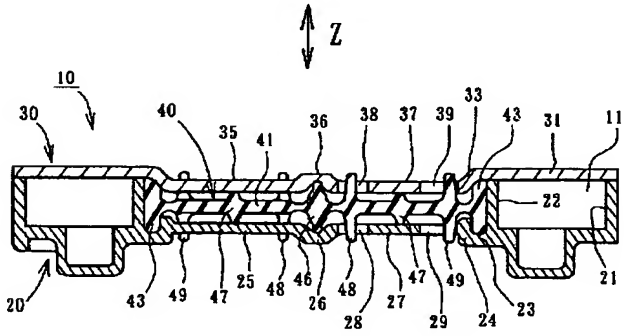
(22)出願日　平成13年４月10日(2001.4.10)

(71)出願人　000177900
山下ゴム株式会社
埼玉県入間郡大井町大字亀久保1239番地
(72)発明者　斉藤　淳
埼玉県入間郡大井町大字亀久保1239番地
山下ゴム株式会社内
(72)発明者　佐島　和俊
埼玉県入間郡大井町大字亀久保1239番地
山下ゴム株式会社内
(74)代理人　100089509
弁理士　小松　清光

最終頁に続く

(54)【発明の名称】　液封防振装置用弾性膜構造

(57)【要約】
【目的】弾性膜のバネ弾性を多段階かつ非線形的に変化させる。
【構成】支持部本体２０とフタ３０の間に弾性膜４０を挟んで弾性膜組立体１０を組み立てる４０は外周部に固定用の環状壁４３、中央に第１の支持点４６、中間部に第２の支持点４７、さらに第２の支持点４７を挟んで内周側に内側サイドストッパ４８、外周側に外側サイドストッパ４９を設ける。第１の支持点４６と第２の支持点４７は支持部本体２０とフタ３０に圧接させ、内側サイドストッパ４８と外側サイドストッパ４９は主たる振動入力方向方向へ突出させかつ弾性変形の中心方向へ傾けるとともに、主たる振動入力方向と略直交する方向から支持部本体２０及びフタ３０側へ押し当てる。



1

【特許請求の範囲】

【請求項１】　主液室と副液室と仕切り部材で区画し、これら主液室と副液室をオリフィス通路で連通するとともに、前記仕切り部材に主液室の内圧変動吸収用の弾性膜を設けた液封防振装置において、前記弾性膜の外周部を支持部材へ固定するとともに、中心部に第１の支持点及び中心部と外周部との中間部に第２の支持点を設け、それぞれを前記支持部材へ当接させ、かつ主たる振動入力方向とほぼ直交する方向で支持部材へ当接するサイドストッパを設けたことを特徴とする液封防振装置用弾性膜構造。

【請求項２】　前記サイドストッパは主たる振動入力方向へ突出する突起として前記弾性膜と一体に形成するとともに、主たる振動入力方向に対して突出端が弾性膜の変形中心方向へ近づくように傾斜していることを特徴とする請求項１に記載した液封防振装置用弾性膜構造。

【請求項３】　前記サイドストッパは、前記第２の支持点を間に挟んで弾性膜の外周部側及び中心側に配置されていることを特徴とする請求項１に記載した液封防振装置用弾性膜構造。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、液封防振装置用弾性膜構造に係り、特にそのバネ弾性を多段かつ非線形的に変化させるようにしたものに関する。

【０００２】

【従来の技術】弾性膜を設けた液封防振装置は公知である。図８に弾性膜の一例を含めて液封防振装置の概略を示す。この液封防振装置はエンジン支持用の円錐形マウントであり、エンジン側へ取付けられる第１の取付部１と、車体側へ取付けられる第２の取付部２とを円錐形のゴム体３で連結し、ゴム体３の内部空間をダイアフラム４で密閉するとともに、内部に仕切り部材５を設けて主液室６と副液室７に区画し、両液室を図示省略のオリフィス通路で連通したものであり、仕切り部材５は剛性のある枠８でゴム等からなる弾性膜９の周囲を固定したものであり、主液室６の内圧変動に応じて弾性変形することによりこれを吸収するようになっている。

【０００３】

【発明が解決しようとする課題】ところで、このような液封防振装置には、乗り心地を良好にするため、小振動には低動バネとなり、大振動には高減衰となるような特性が求められ、このような特性は弾性膜によっても実現可能である。しかし、上記従来構造の場合、弾性膜９の外周部を主たる振動入力方向Ｚ方向、すなち図の上下方向から枠８にて固定するだけのため、弾性膜９の弾性変形におけるバネ弾性はほぼ一定であって、加わる力と変形量の関係は略線形となる。したがって、小振動を吸収する乗り心地を優先させれば高減衰が得られず、一方、大振動の減衰を優先するように設定すれば、低動バネにならないので、妥協した中間的な設定にせざるをえなかった。そこで本願発明はこのような妥協をせずに、バネ弾性を多段かつ非線形的に変化可能にすることを目的とする。

2

【０００４】

【課題を解決するための手段】上記課題を解決するため本願の液封防振装置に係る第１の発明は、主液室と副液室と仕切り部材で区画し、これら主液室と副液室をオリフィス通路で連通するとともに、前記仕切り部材に主液室の内圧変動吸収用の弾性膜を設けた液封防振装置において、前記弾性膜の外周部を支持部材へ固定するとともに、中心部に第１の支持点及び中心部と外周部との中間部に第２の支持点を設け、それぞれを前記支持部材へ当接させ、かつ主たる振動入力方向とほぼ直交する方向で支持部材へ当接するサイドストッパを設けたことを特徴とする。

【０００５】第２の発明は、上記第１の発明において、前記サイドストッパを主たる振動入力方向へ突出する突起として前記弾性膜と一体に形成するとともに、主たる振動入力方向に対して突出端が弾性膜の変形中心方向へ近づくように傾斜していることを特徴とする。このとき、前記サイドストッパを、前記第２の支持点を間に挟んで弾性膜の外周部側及び中心側に配置することもできる。

【０００６】

【発明の効果】第１の発明によれば、弾性膜の外周部を固定するとともに中心部に第１の支持点、中間部に第２の支持点を設けたので、小振動が入力するとまず全体が弾性変形して第１の支持点が圧縮され、次第にバネ弾性が高くなる。この段階では小振動を吸収するとともに低動バネになる。やがて第１の支持点の圧縮が限界になると、第１の支持点を支点として第１の支持点と外周部の間において弾性変形を生じる。したがって、弾性変形のスパンが半減するため、バネ弾性は大きくなる。この段階の弾性変形では、第２の支持点を圧縮しながら行われ、やや大きめの振動を吸収でき、比較的低動バネを持続する。

【０００７】やがて第２の支持点も圧縮限界になると、第２の支持点を支点として、第２の支持点と第１の支持点の間及び第２の支持点と外周部の間における弾性変形に変化する。この弾性変形は、さらに変形スパンが半減するのでバネ弾性が著しく大きくなる。しかも、サイドストッパが強く支持部材側へ押し付けられるので、これによってもバネ弾性が増大し、その結果、高減衰を実現できる。しかも、第１の支持点及び第２の支持点並びにサイドストッパは当初から支持部材へ押し当てられているから打音が発生せず、騒音を軽減する。また、サイドストッパは主たる振動入力方向と略直交する方向から支持部材側へ押し当てられるので、バネ弾性の非線形的変化に寄与できるとともに、弾性膜の弾性変形を阻害しな

い。

【０００８】第２の発明によれば、サイドストッパが主たる振動入力方向へ突出する突起であり、かつ主たる振動入力方向に対して先端側が弾性膜における弾性変形の中心側へ近づくよう傾いているので、当初は支持部材に対して強く押し当てられず、弾性膜の弾性変形量が大きくなるにしたがって次第に強く押し当てられるので、累進的にバネ弾性が大きくなる。このため、非線形的なバネ弾性の変化を顕著に発現できる。

【０００９】このとき、サイドストッパを外周部及び中心部の第１の支持点近傍に第２の支持点を挟んで配置すれば、第１の支持点が変形の支点となった段階から、中心部と外周部でサイドストッパの効果が生じるため、サイドストッパによるバネ弾性の段階的変化をさらに大きくできる。

【００１０】

【発明の実施の形態】以下、図面に基づいて実施例を説明する。図１は弾性膜と支持体を一体化した弾性膜組立体の平面図、図２は図１の２－２線断面図、図３は第１の支持点の押し当て構造を拡大して示す図、図４は弾性膜の平面図、図５は図４の５－５線断面図、図６は弾性膜の締め込みを説明する図、図７は作用を原理的に示す図である。

【００１１】まず、図１及び図２において、この弾性膜組立体１０は支持部本体２０とフタ３０の間に弾性膜４０を挟み込んで一体化したものであり、全体として平面視円形をなす。支持部本体２０は外周部に図２の上方へ開口する溝２１が設けられ、この溝２１を利用してダンピングオリフィス通路１１を形成する。溝２１の内壁面をなす環状仕切壁２２の内周側には、断面略Ｕ字状の環状溝２３が設けられ、環状溝２３の内周壁２４は図２の上下方向へ長い押し当て面になっている。

【００１２】環状仕切壁２２に囲まれた内側部分は弾性膜４０収容部であり、内周壁２４の内側に形成される円形の底部２５の中心部２６は図２の下方へ突出する湾曲部をなす。中心部２６と内周壁２４の中間部分は中間固定部２７をなす。中間固定部２７は底部２５の一部であって、その内周側及び外周側にはそれぞれ開口部２８，２９が形成されている。各開口部２８，２９は、同心円上に等間隔で複数形成される。特に開口部２９は長い円弧状に形成され、これらはフタ３０側に形成される開口部と対応している（図１参照）。

【００１３】フタ３０は金属製の略円板状部材であり、外周部３１は溝２１の開口部を覆い、溝２１とともにダンピングオリフィス通路１１を形成している。なお、図示していないが外周部３１には主液室へ開口するダンピングオリフィス通路の入り口が形成され、支持部本体２０の外周部底部側には副液室へ開口する出口が設けられている。フタ３０の外周部３１から内周側へ移る部分であって、環状仕切壁２２との当接部より内周側かつ環状溝２３の上方となる部分は図２の下方側へ落ち込む段部３３をなす。

【００１４】フタ３０の外周部３１より内周部は底部２５に対応する円形の天井部３５であり、その中心３６は図２の上方へ突に湾曲して中心部２６と対応する。また、中間固定部２７及び開口部２８，２９とそれぞれ対応する位置に中間固定部３７、開口部３８，３９が形成されている。中間固定部３７は天井部３５の一部である。底部２５と天井部３５の間は適当な間隔が設けられ、弾性膜４０を収納するようになっている。

【００１５】弾性膜４０は図４及び５にも詳しいように、ゴムやエラストマーなどの適宜弾性材料からなる部材であり、平面視略円板状をなすとともに、本体部４１の図５における上下方向に複数の突部が一体に突出形成されている。まず、外周部には環状溝２３へ嵌合する環状壁４３が図５の上下方向へ突出して形成され、中心部には第１の支持点４６、中間固定部２７及び３７に対応する位置には第２の支持点４７、開口部２８，３８に対応する位置には内側サイドストッパ４８、開口部２９，３９に対応する位置には外側サイドストッパ４９が設けられている。

【００１６】第１の支持点４６は中心部２６及び３６へ先端が嵌合し、第２の支持点４７は中間固定部２７及び３７へ当接する。なお、図６に示すように、、第１の支持点４６及び第２の支持点４７の先端は中心部２６，３６及び中間固定部２７，３７によって組立時に圧縮されるよう長めに突出した締め代が設けられている。

【００１７】内側サイドストッパ４８及び外側サイドストッパ４９は開口部２８，３８及び２９，３９から外部へ突出するよう長く形成されている。なお、各開口部２８，２９，３８，３９の大きさは、周方向の長さが内側サイドストッパ４８，外側サイドストッパ４９と同程度の長さであり、径方向には内側サイドストッパ４８，外側サイドストッパ４９の弾性変形を許容できるよう間口を広く開口している。

【００１８】図３は、第１の支持点４６における中心部２６に対する締め代を示すための拡大図である。なお、中心部３６側でも同様である。上段のＡは組立時の状態を示し、第１の支持点４６の先端に形成された仮想線で示す締め代５０は圧縮されて消滅するが、第１の支持点４６の中心部２６へ押し当てられた周囲にはまだ間隙５１が形成されている。

【００１９】図３の下段Ｂは弾性膜４０の弾性変形時における第１の支持点４６の状態を示し、この場合、第１の支持点４６が中心部２６へ強く押し当てられて圧縮されると、間隙５１を埋めるよう弾性変形し、斜線で示す間隙５１を埋めた充填部５２が形成される。この状態になると、第１の支持点４６のバネ弾性は著しく大きくなり非線形的的に変化する。

【００２０】図５に示すように、内側サイドストッパ４

5

８は主たる振動入力方向Ｚに対して、先端が半径方向外方へ向くように傾いている。この傾き方向は、内側サイドストッパ４８が機能する段階では第２の支持点４７を中心とし、第１の支持点４６と環状壁４３間における弾性変形となるので、弾性変形の中心すなわち第２の支持点４７側へ傾くことになる。なお、傾き角ａ，ｂは適宜に決定され、一致もしくはいずれか側をより大きくする等の調整が任意に可能である。また全体を傾けずに支持本体部２０及びフタ３０へ押し当てられる面のみをテーパー状に形成してもよい。

【００２１】一方、外側サイドストッパ４９は中心側に傾いている。この場合は、第１の支持点４６が弾性変形の中心となる初期段階及び第２の支持点４７が中心となるその後の段階のいずれにおいても弾性変形の中心側へ傾いていることになる。また、傾き角ｃ，ｄは内側サイドストッパ４８と同様に任意に設定することができる。

【００２２】次に、本実施例の作用を説明する。図７は弾性膜４０の変形を模式的に示すものであり、まずＡは、弾性変形前の基本状態である。Ｂは初期段階の弾性変形であって、比較的小振幅の小振動に対応する。この段階では外周部の環状壁４３を固定されているため第１の支持点４６を圧縮しながら、弾性膜４０全体が一つの弧状をなして下方へ湾曲し、バネ弾性が比較的小さい状態で振動を吸収するため、低動バネとなる。

【００２３】Ｃは、さらに大きい振動が加わり、第１の支持点４６の圧縮限界になると、第１の支持点４６が固定点となるので、環状壁４３と第１の支持点４６を固定端とし、第２の支持点４７を中心とした弾性変形を生じ、弾性膜４０は全体として断面略Ｗ字状をなす。この段階では、弾性変形のスパンが半減するので、バネ弾性が段階的に大きくなり、より大きな振動を吸収できる。

【００２４】Ｄは、さらに大振動の入力があった状態を示し、この場合は第２の支持点４７も圧縮限界となるので、第２の支持点４７を支点として第２の支持点４７と環状壁４３の間及び第２の支持点４７と第１の支持点４６の間で弾性変形を生じる。すなわち、環状壁４３と第１の支持点４６の間でさらに断面略Ｗ字状に弾性変形することになり、弾性変形のスパンがさらに半減されるため、バネ弾性は極めて大きくなり、弾性膜４０による振動の吸収がなくなり、ダンピングオリフィス通路における液柱共振により振動を減衰させる高減衰状態となる。

【００２５】しかも、この状態では内側サイドストッパ

6

４８及び外側サイドストッパ４９は、それぞれの弾性変形側先端部すなわち図の各下端が第２の支持点４７を挟んでこれから遠ざかるように傾き、それぞれが中間固定部２７及び内周壁２４へ強く押し当てられる。開口部２８及び外側サイドストッパ４９は当初中間固定部２７及び内周壁２４と接触を軽くする方向へ傾いていたものであるから、この押し当てによるバネ弾性の変化は非線形的に上昇する。したがって、内側サイドストッパ４８、外側サイドストッパ４９によっても、弾性膜４０におけるバネ弾性の非線形的変化を増幅できる。

【００２６】また、内側サイドストッパ４８、外側サイドストッパ４９は主たる振動入力方向Ｚに対して略直交方向から支持部本体２０又はフタ３０側へ押し当てられるようになっているので、小振動に対してはバネ弾性の変化にあまり寄与せず、低動バネ化に貢献する。さらに弾性膜４０の上下にて直接弾性変形に抗するものではないから弾性膜４０の弾性変形を阻害しない。

【００２７】そのうえ、第１の支持点４６、第２の支持点４７、内側サイドストッパ４８、外側サイドストッパ４９は当初から支持部本体２０又はフタ３０側へ接触させられているため、弾性膜４０が弾性変形しても打音を発生することが少なくなり、騒音の低減に役立つ。

【００２８】なお、本願発明は上記の各実施例に限定されるものではなく、発明の原理内において種々に変形や応用が可能である。例えば、支持点の数は２以上であれば、さらに多くすることは任意に可能である。また、エンジンマウント以外の自動車用又はその他の各種防振装置に適用できる。

【図面の簡単な説明】

【図１】実施例に係る弾性膜組立体の平面図

【図２】図１の２－２線断面図

【図３】第１の支持点の押し当て構造を拡大して示す図

【図４】弾性膜の平面図

【図５】図４の５－５線断面図

【図６】弾性膜の締め込みを説明する図

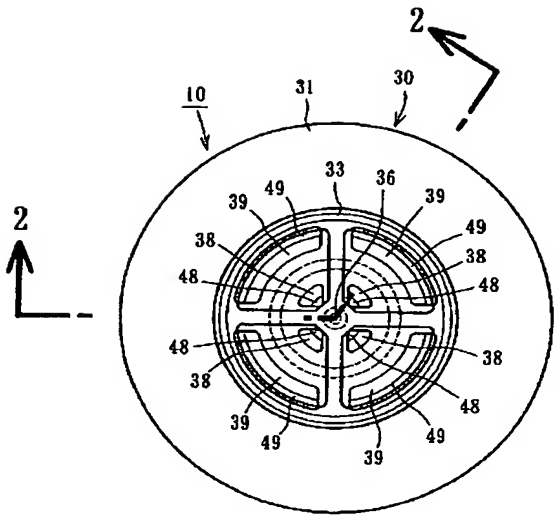
【図７】図７は作用を原理的に示す図

【図８】従来例の概略図

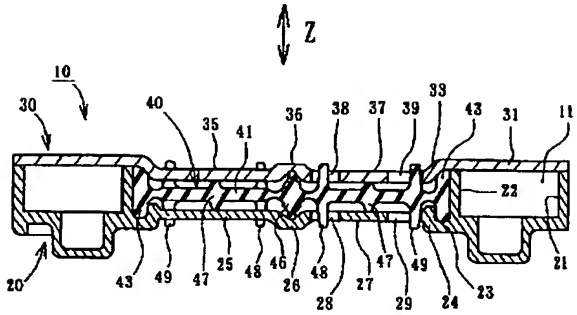
【符号の説明】

１０：弾性膜組立体、２０：支持部本体、３０：フタ、４０：弾性膜、４３：環状壁、４６：第１の支持点、４７：第２の支持点、４８：内側サイドストッパ、４９：外側サイドストッパ

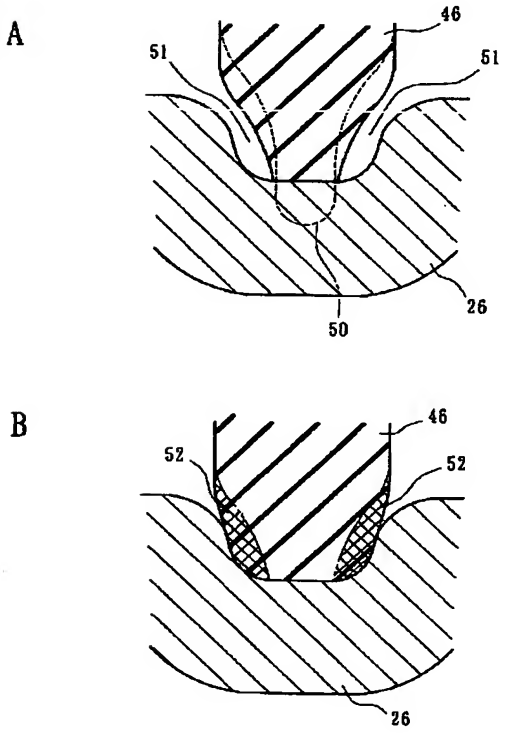
【図１】


2
10
31
30
33
36
39
49
38
48
2

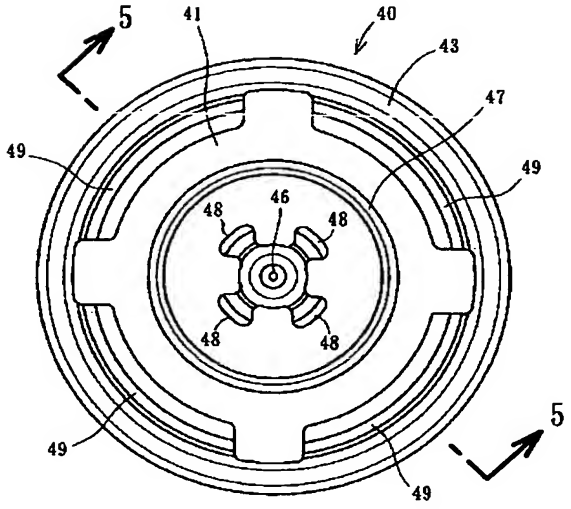
【図２】


Z
10
30
40
35
41
36
38
37
39
33
43
31
11
22
20
21

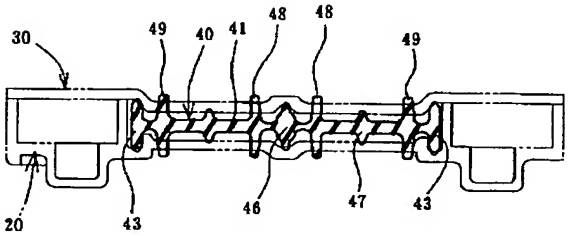
【図３】


A
B
46
51
26
50
52

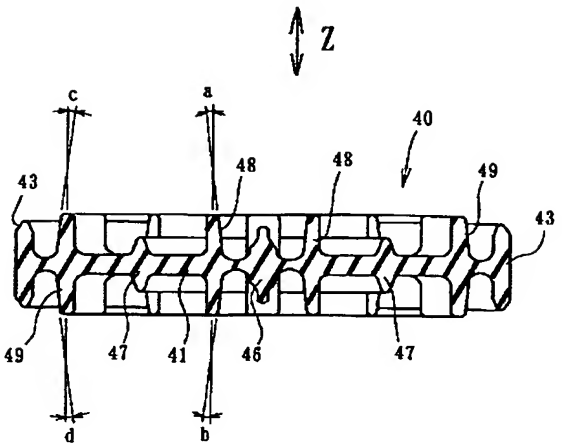
【図４】


5
41
40
43
47
49
48
46

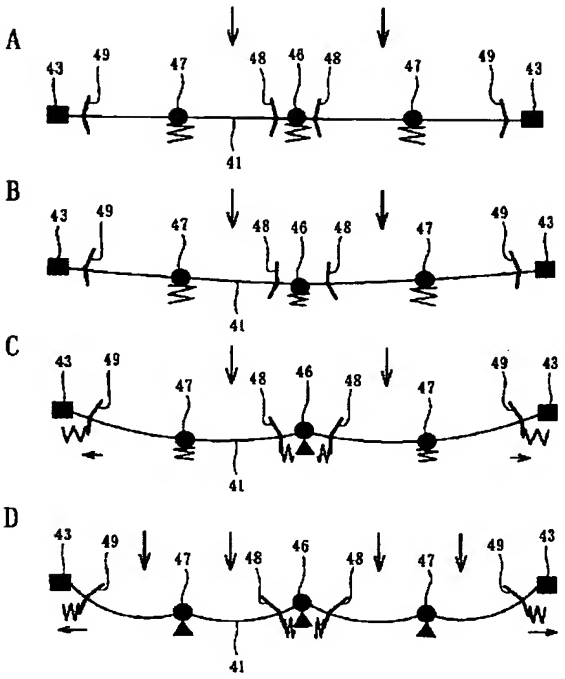
【図６】


30
49
40
41
48
20
43
46
47

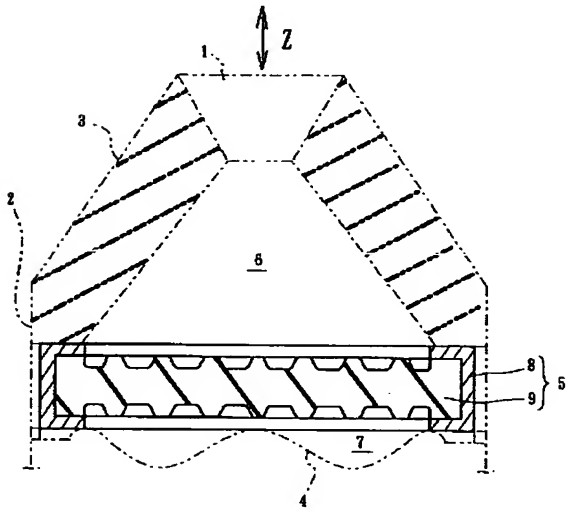
【図５】



【図７】



【図８】



フロントページの続き

Ｆターム(参考)　3J047 AA03 DA02 FA02